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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte GERALD J. BRUCK and AHMED KAMEL

Appeal 2016-003395
Application 14/017,337
Technology Center 1700

Before ADRIENE LEPIANE HANLON, GEORGE C. BEST, and
SHELDON M. McGEE, *Administrative Patent Judges*.

McGEE, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's final decision to reject claims 1–4, 7, 8, and 11–22. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM-IN-PART.

BACKGROUND

The subject matter on appeal relates to methods of preparing anchoring structures on a surface designed to enhance adherence of thermal barrier coatings thereon. Specification, hereinafter “Spec.,” 1:5–10.

Independent claims 1 and 16 are representative and are reproduced from pages 23 and 24 of the Appeal Brief (Claims Appendix), as follows:

1. A method comprising:

applying a laser beam to a surface of a solid material to form a liquefied bed on the surface of the solid material;

applying a pulse of laser energy to at least a portion of the liquefied bed to cause a splash of liquefied material outside the liquefied bed; and

forming on the surface of the solid material a three-dimensional anchoring structure upon solidification of the splash of liquefied material;

wherein the applying of the pulse of laser energy to the portion of the liquefied bed is performed subsequent to the applying of the laser beam to the surface of the solid material.

16. A method comprising:

delivering a pattern of energy scanning a surface of a solid material to create a moving pool of liquefied material which re-solidifies along a trailing edge; and

repeatedly impacting the moving pool of liquefied material with respective pulses of energy effective to create a respective plurality of anchoring structures across the surface as the pool moves and the surface re-solidifies.

REFERENCES

The Examiner relies on the following references as evidence of unpatentability:

Jackson, et al. (hereinafter “Jackson”)	US 4,884,820	Dec. 5, 1989
Skelly, et al.	US 5,419,971	May 30, 1995

(hereinafter “Skelly”)

Murison, et al.
(hereinafter “Murison”)

US 2012/0111841 A1 May 10, 2012

REJECTIONS

The following rejections are before us on appeal:

- I. Claims 1–4, 7, 8, and 20 under 35 U.S.C. § 103 as unpatentable over Jackson in view of Murison (Final Act. 3–9; Ans. 2–7);
- II. Claims 11–15 under 35 U.S.C. § 103 as unpatentable over Jackson in view of Murison (Final Act. 9–13; Ans. 7–12);
- III. Claims 16–19 under 35 U.S.C. § 103 as unpatentable over Skelly in view of Jackson (Final Act. 13–17; Ans. 12–15);
- IV. Claim 22 under 35 U.S.C. § 103 as unpatentable over Skelly in view of Jackson, and further in view of Murison (Final Act. 17–19; Ans. 15–18); and
- V. Claims 1, 20, and 21 under 35 U.S.C. § 103 as unpatentable over Skelly in view of Jackson, and further in view of Murison (Final Act. 19–24; Ans. 18–23).

ANALYSIS

Rejection I

The Examiner finds that Jackson teaches the claimed method except for the step requiring “applying the laser energy to form the liquefied pool prior to applying the laser pulse to splash the material.” Final Act. 4; Ans. 3. The Examiner finds that “Jackson teaches applying a pulse of laser energy to the surface of the substrate to both melt the solid material to form the liquefied bed and also to cause the material to splash outside of the liquefied bed . . . in one processing step.” *Id.*

The Examiner finds that “Murison teaches a method of employing a series of laser pulses” to drill holes in a substrate, “where one or more characteristics of the laser pulses is changed in series in order to optimize the drilling process for the hole.” Final Act. 5; Ans. 3. The Examiner finds further that “Murison teaches that laser parameters such as pulse width, pulse energy, temporal pulse shape, peak power, average power, and repetition rate can be optimized to obtain the most desirable hole attributes for the desired application.” Final Act. 5, Ans. 23 (citing Murison ¶ 7); *see also* Ans. 3. The Examiner also finds that Murison teaches “that material melted by a long pulse may be more prone to splattering on to the surface near the entrance hole [] indicating that melted material is more easily splashed up and recast around the formed hole,” and teaches that “an operator will perform a series of experiments where values are chosen for the laser operating characteristics.” Ans. 24, (citing Murison ¶¶ 55, 58).

The Examiner concludes that it would have been obvious to the ordinary skilled artisan “to modify the teachings of Jackson to use multiple laser pulses” because such modification would “optimize the formation of the recesses and the splashing of the molten material to form the roughened surface” of the three-dimensional anchoring structure. Final Act. 6; Ans. 4–5. The Examiner concludes further that because

Murison teaches optimizing laser parameters such as laser energy and power to control hole formation and material build up around the hole, that melted material is more prone to splashing out of the hole to be recast around the hole, and that it is known to perform experiments with various laser parameters to obtain the desired hole attributes, [including] the amount of material built up around the holes as well as the debris or residue formed around the hole[,] and [because] Jackson teaches a method of forming land areas and depression[s] to roughen a surface using laser processing[,] it would have been obvious to a person having

ordinary skill in the art . . . to modify the teachings of Jackson to determine by routine experimentation optimal laser settings to form the roughened surface such that the process of forming the land areas and depressions will result in using multiple laser pulses to optimize the degree of splashing such that a laser pulse will first melt the material, which is more prone to splashing as taught by Murison and then use a second laser pulse directed at the liquefied bed to thus form the raised land areas and depressions.

Ans. 24.

Appellants argue claims 1–3 and 8 as a group (Appeal Br. 3–7; Reply Br. 1–3) and argue claims 4, 7, and 20 separately (Appeal Br. 7–10; Reply Br. 3–4). We therefore decide the propriety of this rejection on the basis of claims 1, 4, 7, and 20. Dependent claims 2–3 and 8 will stand or fall with independent claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

Claim 1

Appellants present several arguments that neither Jackson nor Murison, either alone or in combination, teach the claimed limitations. Appeal Br. 3–7; Reply Br. 1–3. Specifically, Appellants contend that MPEP § 2143 I.A. “requires that at least one of the references (Jackson or Murison) teaches applying a pulse of laser energy to a portion of a liquefied bed subsequent to applying a laser beam to a surface of the solid material to form the liquefied bed.” Appeal Br. 5.

These arguments are not persuasive of reversible error. First, we note that MPEP § 2143 I.A. outlines one of several exemplary, but non-exhaustive, rationales that may support a conclusion of obviousness. The rationale set forth in MPEP § 2143 I.A. (combining prior art elements according to known methods to yield predictable results), however, is not the rationale relied upon by the Examiner to conclude that claim 1 is obvious.

Rather, the Examiner repeatedly relies upon the doctrine of optimization to arrive at this conclusion. Final Act. 6, Ans. 4–5, 24–25.

Appellants’ arguments focus on how the references individually teach away from, or fail to teach, one or more claim limitations. Appeal Br. 3–7; Reply Br. 1–3. Importantly, however, Appellants do not address in their Reply Brief the Examiner’s finding (Ans. 24) regarding Murison’s disclosure of using a longer laser pulse to melt the surface material, making it more prone to splattering (Murison ¶ 58). Appellants’ arguments also fail to address, and, thus, fail to identify error in, the Examiner’s conclusion that it would have been obvious “to *modify* the teachings of Jackson to determine by routine experimentation optimal laser settings to form the” claimed anchoring structures by using “multiple laser pulses to optimize the degree of splashing such that a laser pulse will first melt the material, which is more prone to splashing as taught by Murison and then use a second laser pulse directed at the liquefied bed to thus form the” anchoring structures. Ans. 24 (emphasis added).

The obviousness analysis “need not seek out precise teachings directed to the specific subject matter [but] can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). “A person of ordinary skill is also a person of ordinary creativity, not an automaton.” *Id.* at 421.

Upon consideration of the combined teachings of Jackson and Murison identified in the Final Action and the Answer, we agree with the Examiner that it would have been obvious to the ordinary skilled artisan

to use a first set of laser parameters to melt and vaporize some of the material to form the liquefied bed and provide vaporization

of some of the material and then use a second set [of] laser parameters to recast material from the liquefied bed to form the land areas [because] melted material is more prone to splattering.

Ans. 24–25. We determine that this would have been obvious to a person of ordinary skill seeking to create the claimed three-dimensional anchoring structures because the cited references teach one how to optimize laser parameters to melt surface material to make it more prone to splashing or splattering, i.e., using a laser pulse of sufficient duration to achieve an adequate degree of surface material melt. *See*, Murison ¶ 58. Such ordinary skilled artisan would have known that applying a subsequent laser pulse having sufficient energy to the melted material would cause it to splash (i.e., move) to an area outside of the melted material and then be recast as a three-dimensional anchoring structure. Armed with this knowledge, the skilled artisan would have employed no more than ordinary creativity to optimize the laser parameters as taught by Murison, to modify Jackson’s one-step process of “melting, moving and recasting” using one laser pulse (Jackson 6:58–60) to comprise two distinct applications of laser energy as claimed.

Therefore, because Appellants’ arguments regarding claim 1 (Appeal Br. 3–7; Reply Br. 1–3) fail to identify reversible error, we sustain the Examiner’s rejection of claims 1–3 and 8.

Claim 4

Claim 4 depends from claim 1 and requires that “the applying of the laser beam to the surface of the solid material comprises a scanning by the laser beam over the surface of the solid material.” Appeal Br. 23. The Examiner determines that Jackson’s “relative motion between the laser and the substrate” results in the claimed scanning over the substrate surface

because the claim “does not require that the laser is continuously applied during the scanning.” Ans. 30. The Examiner also finds that Murison “teaches that the laser is moved relative to the substrate.” Final Act. 7.

Appellants contend that, contrary to the Examiner’s assertion, “claim 4 expressly requires that the laser is scanned over the surface while it is being applied.” Reply Br. 4. Appellants argue that neither Jackson nor Murison teach or suggest this claim limitation because the laser in both references “is only applied at specific locations (i.e.,] where holes are to be drilled)” and is thus not applied continuously during the surface scan. Appeal Br. 8.

This argument is persuasive of reversible error. In this regard, we first note that the plain language of claim 4 supports Appellants’ position that claim 4 requires continuous application of the laser during scanning. Claim 4 depends from claim 1, which recites “applying a laser beam to a surface of solid material to form a liquefied bed on the surface.” Claim 4 specifies that “*the applying . . . comprises a scanning by the laser beam over the surface of the solid material*” (emphasis added). Thus, the plain language of claim 4 recites that while the laser beam is being applied, “a scanning” of said laser beam “over” the substrate occurs.

This construction is furthermore supported by Appellants’ Specification which describes the scanning of a substrate with a laser beam. Specifically, it states that “laser beam 10 may be applied to a surface 12 of solid material 14 by way of a beam-scanning technique (e.g., two-dimensional scanning) of laser beam 10 of the surface of the solid material, as represented by scanning grids 28.” Spec. 4:26–5:2. Turning to Fig. 1, scanning grids 28 extend along one plane of the liquefied bed 16 which is created by application of laser beam 10 to surface 12. This suggests that the

laser beam 10 is applied in an uninterrupted fashion during scanning of surface 12, thus allowing liquefied bed 16 to form along the elongated scanning grid pattern 28.

To establish a prima facie case of obviousness, the Examiner must show that each and every limitation of the claim is described or suggested by the prior art or would have been obvious based on the knowledge of those of ordinary skill in the art or the inferences and creative steps a person of ordinary skill in the art would have employed. *In re Fine*, 837 F.2d 1071, 1074 (Fed. Cir. 1988); *KSR*, 550 U.S. at 417.

Because the Examiner fails to establish that Jackson or Murison describes or suggests continuous application of the laser during the scanning over its substrates, or that such continuous application of the laser would have been obvious based on the combination of Jackson and Murison, we do not sustain the rejection of claim 4.

Claim 7

Separately argued claim 7 depends from claim 1 and recites that “the applying of the pulse of laser energy comprises focusing the pulse of laser energy onto the portion of the liquefied bed.” The Examiner cites Murison’s disclosure regarding the focusing of the laser (¶¶ 6, 7, 74; Final Act. 8) and concludes that it would have been obvious to focus the laser beam “on the liquefied bed during [the] second pulse.” Ans. 32.

Appellants contend that neither Jackson nor Murison, individually or combined, teach the limitation requiring focusing a pulse of laser energy onto a portion of a liquefied bed. Appeal Br. 8–9; Reply Br. 4. As with the rejection of claim 1, however, Appellants fail to address the Examiner’s finding regarding Murison’s disclosure of using a longer laser pulse to melt

the surface material, making it more prone to splattering (Murison ¶ 58). Appellants also do not address the Examiner’s rationale for modifying Jackson’s method with the teachings of Murison, and thus fail to account for what the ordinary skilled artisan would have done when confronted with the teachings of these references.

Here, the Examiner established that it was well-known to focus a laser beam (Ans. 31, citing Murison ¶¶ 6, 7, 74) and concluded that the ordinary skilled artisan would have been motivated to focus a laser on the desired spot on the substrate to be melted and upon melting “the laser beam will then be focused on the liquefied bed during the second pulse in the process.” Ans. 32.

Thus, because Appellants fail to address the full scope of the Examiner’s rejection, Appellants fail to identify reversible error in the obviousness conclusion. We, therefore, sustain the rejection of claim 7.

Claim 20

Separately argued claim 20 depends from claim 1 and recites that “the three-dimensional anchoring structure is formed of the solid material.” The Examiner finds that Jackson teaches this limitation at 3:4–8. Final Act. 9.

Appellants contend that the Examiner’s statement in the Advisory Action¹ that Jackson’s “recast material differs considerably from the original coating” distinguishes the claimed subject matter because the recast material “is ‘denser and less porous than the original material and may have a different atomic structure’.” Appeal Br. 9–10 (citing Jackson 6:55–60).

¹ Advisory Action mailed June 29, 2015.

This argument is not persuasive of reversible error. First, we note that Appellants selectively restate only a portion of the Examiner’s statement in the Advisory Action, and omit a key statement—that Jackson’s recast material “is still understood to be formed *from the coating material*.” Adv. Act. 9 (emphasis added). We furthermore observe that claim 20 does not require the anchoring structure formed of the solid material to have identical density, porosity or atomic structure as the original coating material. Rather, claim 20 merely requires the “anchoring structure [to be] formed of the solid material.” *In re Self*, 671 F.2d 1344, 1348 (CCPA 1982) (“[A]ppellant’s arguments fail from the outset because . . . they are not based on limitations appearing in the claims.”).

We, therefore, sustain the Examiner’s rejection of claim 20.

Rejection II

The Examiner rejects claims 11–15 under 35 U.S.C. § 103 as unpatentable over the same Jackson and Murison references relied upon in Rejection I. Final Act. 9–13; Ans. 7–12.

Appellants present many of the same arguments against Rejection II as they do against Rejection I. Appeal Br. 10–12. Specifically, Appellants argue that neither Jackson nor Murison, alone or in combination, teach the claimed limitations. *Id.* As with Rejection I, however, Appellants fail to address the Examiner’s additional findings regarding Murison’s teachings at ¶ 58, as well as the Examiner’s rationale for modifying Jackson’s method with the teaching of Murison, to arrive at the claimed subject matter. Because Appellants focus their arguments on only a portion of the Examiner’s findings, and also fail to address the Examiner’s obviousness

rationale, Appellants fail to identify reversible error in the Examiner's obviousness conclusion.

We also observe that Appellants make purported "additional arguments . . . in support of the patentability of dependent claim 13" and simply state the limitations of claim 13 followed by what is believed to be an attempt at incorporating arguments already made with respect to claim 1. We do not consider such statements to be separate arguments in accordance with our Rules. Specifically, we emphasize that "arguments shall *explain* why the examiner erred as to each ground of rejection contested." 37 C.F.R. § 41.37(c)(1)(iv) (emphasis added). Skeletal arguments or arguments merely amounting to assertions that the references do not disclose or suggest certain claim limitations are not arguments for separate patentability in compliance with our Rule 41.37(c)(1)(iv). *See In re Lovin*, 652 F.3d 1349, 1356–57 (Fed. Cir. 2011).

We, therefore, sustain Rejection II.

Rejections III – V

In each of Rejections III and IV, the Examiner relies on Jackson's disclosure to establish the formation of a moving liquefied pool which re-solidifies along a trailing edge, as well as the repeated impact of the moving pool with respective pulses to create a plurality of anchoring structures across the surface as the pool moves and the surface re-solidifies. Final Act. 14–15, 17; Ans. 13, 15. In Rejection V, the Examiner relies on Jackson's disclosure to establish the formation of the liquefied bed on the surface of the solid material. Final Act. 20–22.

With respect to Rejections III and IV, Appellants argue that Jackson's single pulse "simultaneously melts and recasts material . . . and thus does not

disclose delivering a pattern of energy scanning a surface of a solid material to create a moving pool of liquefied material which re-solidifies along a trailing edge as recited in independent claim 16.” Appeal Br. 13–14.

Regarding Rejection V, Appellants urge that “Jackson fails to disclose . . . (1) applying a laser beam to form a liquefied bed and (2) applying a pulse of laser energy to cause a splash of liquefied material outside of the liquefied bed.” *Id.* at 19.

Appellants’ arguments persuade us of reversible error. In each of Rejections III–V, the Examiner states that “Jackson teaches applying a pulse of laser energy to the surface of the substrate to *both* melt the solid material *to form the liquefied bed* and also to cause the material to splash outside of the liquefied bed such that it is *in one processing step*.” Final Act. 15, 17, 21 (emphasis added). The Examiner fails to provide, however, any technical reasoning or evidence establishing that, after Jackson’s single pulse of laser energy, there is any liquefied material remaining that is not moved and recast, so as to form a liquefied pool.

The Examiner does not rely on the teachings of Skelly (Rejection III) or Murison (Rejections IV–V) to satisfy the claim limitations requiring the formation of “a moving pool of liquefied material” (claim 16) or “a liquefied bed” (claim 1). Nor does the Examiner establish in Rejections III–V that these claim limitations would have been obvious based on the knowledge of the ordinarily skilled artisan or based on the inferences and creative steps such artisans would have employed. *KSR*, 550 U.S. at 417.

We, therefore, do not sustain Rejections III–V.

DECISION

We affirm the Examiner's rejections of claims 1–3, 7, 8, 11–15, and 20 under 35 U.S.C. § 103(a).

We reverse the Examiner's rejections of claims 4, 16–19, 21, and 22 under 35 U.S.C. § 103(a).

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART